

## The Global Budget of Bomb Radiocarbon



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A self-consistent picture of the global budget of bomb radiocarbon is presented. Using observations and modeling, we derive bomb radiocarbon inventories for the period 1955 through 1990 for the four important reservoirs (ocean, terrestrial biosphere, troposphere, and stratosphere). We assume that the annual production of bomb  $^{14}\text{C}$  is proportional to the megatonnage detonated above ground that year. We determine the constant of proportionality by demanding that the amount of bomb  $^{14}\text{C}$  produced before 1963 equal our estimated total global inventory. We find that our estimated total inventory of bomb  $^{14}\text{C}$  exceeds our estimate of the cumulative bomb  $^{14}\text{C}$  produced by about  $0.8 \times 10^{28}$  atoms of bomb  $^{14}\text{C}$  as of 1990. Hesshaimer et al. (1994) obtained nearly the same result using the same methodology but much simpler models. Unlike Hesshaimer et al., however, we find that the discrepancy between our estimated production and estimated inventory is well within the known uncertainties in the estimated inventories and production. Thus, in contrast to previous studies, our results are self-consistent, and do not imply that any of the inventories in question lie outside previously known uncertainties. In particular, on the basis of the results presented here we see no need to revise existing estimates the ocean uptake of bomb radiocarbon or, by implication, of anthropogenic  $\text{CO}_2$ .

V. Hesshaimer, M. Heimann, and I. Levin, "Radiocarbon evidence for a smaller oceanic carbon dioxide sink than previously believed", *Nature*, **370**, 201 - 203 (1994).

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